RATE DESIGN AND RENEWABLES

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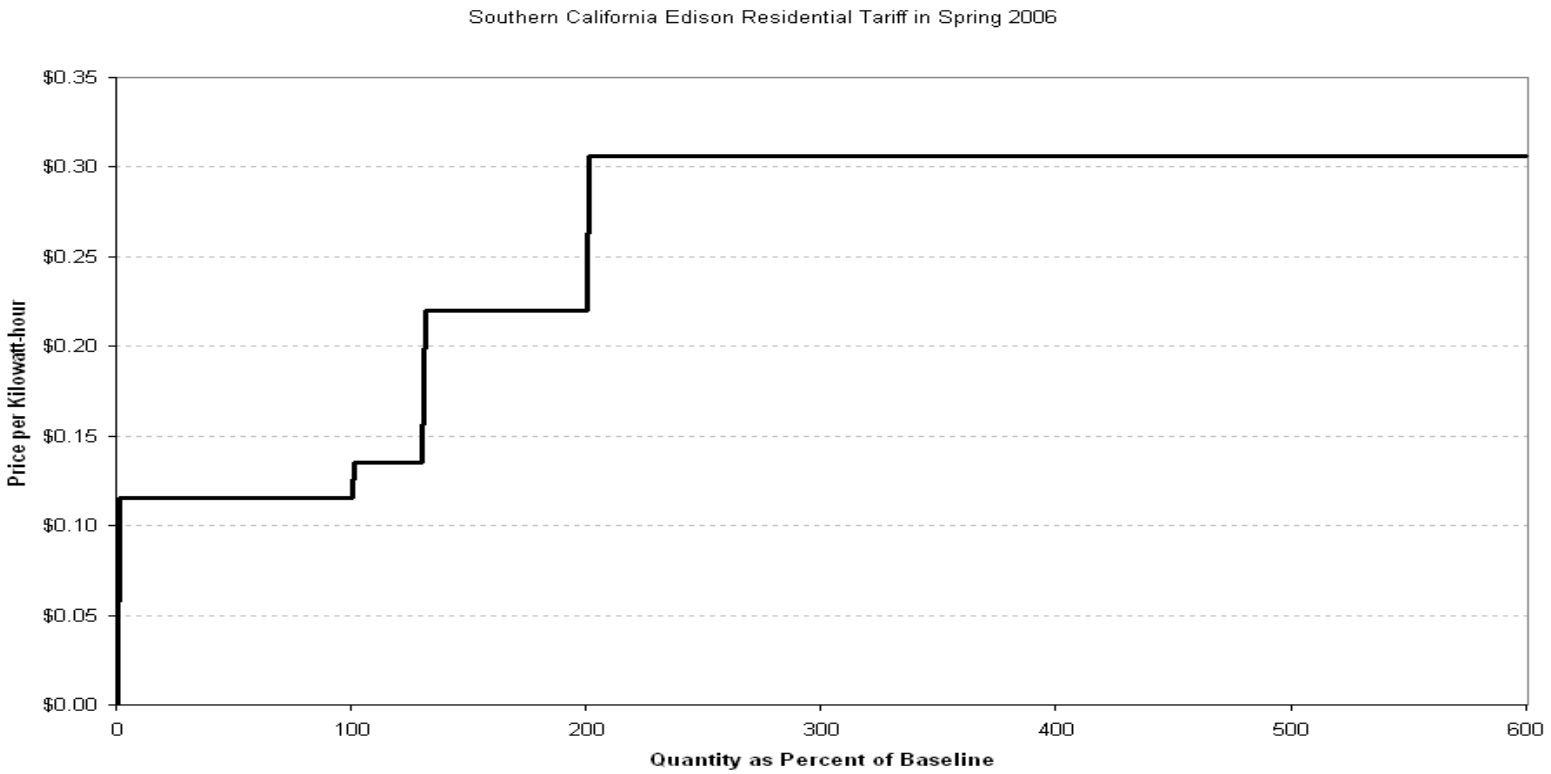
Electricity Rates in a System with High Renewables Penetration

- Basic flat volumetric charge equal to *average cost*
  - Likely sets price above marginal cost at most times
  - But excludes unpriced pollution externalities
- Fixed charges to cover non-volumetric costs
  - More accurately reflects nature of fixed costs
  - But could potentially move price below full social marginal cost (including unpriced pollution externalities)
  - Impact on low-income customers
- Increasing-block pricing
- Time-varying pricing

Increasing-Block Pricing

- EFFICIENCY: Does it send the right signals for electricity consumption from the grid?
- EQUITY: How does it affect low-income customers?



Efficiency Impact of Increasing-Block Pricing

- Ideally, marginal price should reflect full marginal cost, including pollution costs imposed
  - Full MC varies little, if at all, with level of consumption
- Motivation has been to encourage conservation and to protect low-income customers from rate increases
- Recent work by Koichiro Ito (2012) suggests little, if any, conservation or energy efficiency compared to a flat rate
  - because customers respond to average, not marginal, price
    - due to complexity of bill and scarce attention of customers
  - IBP lowers average price for as much consumption as it raises
  - Difficult to design bills to overcome this (ongoing research)
- Is conservation from very high marginal prices efficient?
  - Possible if customers are irrationally reluctant to invest in EE

Equity Impact of Increasing-Block Pricing

- Does IBP help the poor? What is the correlation between household consumption and income?
- Borenstein (forthcoming) shows that IBP does lower the bills of the poorest customers, by about $5/month on average
- Effect would be about double if CARE program didn't exist
- But there are many poor households on high tiers and many wealthy households on low tiers

Efficiency of Time-Varying Pricing

- Efficiency effects are significant, but modest in short run
  - Borenstein (2005) estimates savings from RTP of 3%-5% of energy component of bill for reasonable short-run demand elasticities
- Long-run value of time-varying pricing depends on
  - Supply variability due to intermittent resources
  - Automation of demand response
  - Cost-effectiveness of electricity storage
  - Role of electric vehicles
- Absent major leaps in energy storage technology, the value of time-varying pricing is likely to increase in the future

Equity Effects of Time-Varying Pricing

- Borenstein (2012) studies time-varying usage on a sample of PG&E and SCE households to estimate winners and losers
- Estimates that adopting time-of-use or critical-peak pricing would have approximately the same impact on poorest customers as on all others
- that CPP would make large customers slightly worse off (1%-2%) and small customers better off (5%-6%)
- that CPP would make cooler (coastal) regions significantly better off (6%-8%) and hotter (inland) regions significantly worse off (5%-7%)
  - Could be offset with regional price differences

Net Metering, Increasing-Block Pricing and the subsidies to distributed generation

- Basic problem is that retail prices recover fixed costs through volumetric charges, which "subsidizes" reduction in consumption (including energy efficiency)
  - Much larger problem with IBP because higher-tier prices are far above marginal cost of energy
- Net metering expands the subsidy by allowing "negative consumption" at some times to create consumption reduction at other times
- Fundamental problem isn't net metering, but rather marginal prices that greatly exceed marginal cost
- Current research to quantify subsidy to solar PV from IBP (combined with net metering)
  - and the *net* transfer to/from low-income customers

THANK YOU

QUESTIONS??

References

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